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(54) Disposable safety syringe.

(57) A disposable safety syringe which comprises a barrel (1), an injection needle (4) fitted on the fore end of barrel (1), a plunger (6) being slidable in barrel (1) from a syringe-filling utmost retracted position to a syringe-emptying forwardmost position, and which is fitted with a manually drivable stem (7) protruding from the rear end of barrel (1), a longitudinally slidable protective sleeve (12) slidably fitted on the outside of barrel (1), so as to be movable from a retracted rest position in which the needle (4) is exposed, into an advanced safety position in which the protective sleeve (12) extends around the needle (4), so as to entirely cover the same, and with locking means (23, 25) for automatically retaining in a not retractil manner the protective sleeve (12) to the barrel (1) in its advanced safety position

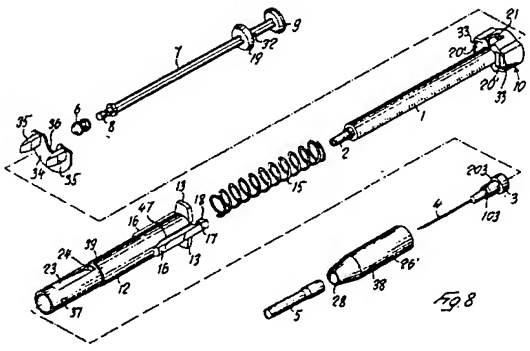

Fig. 8

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The invention relates to a disposable safety syringe which comprises a barrel, an injection needle fitted on the barrel fore end, a plunger being slidable in the barrel from a syringe-filling utmost retracted position to a syringe-emptying forwardmost position, and which is fitted with a manually drivable stem protruding from the barrel rear end, a longitudinally slidable protective sleeve slidably fitted on the outside of the barrel, so as to be movable from a retracted rest position in which the needle is exposed, into an advanced safety position in which the protective sleeve extends around the needle so as to entirely cover the same, and with locking means for automatically retaining in a not retractil manner the protective sleeve to the barrel in its advanced safety position.

The object of the invention is to improve a syringe of the aforementioned type, so as to better its operation and to quite safely prevent the syringe from being re-used, thus eliminating any risk of infection originated from a re-using of the syringe. This is attained by utilizing simple and not much expensive means for the construction of the syringe, which allow to keep the production cost thereof at an extremely low value.

These aims are attained by the invention with the provision of a syringe of the type as described at the outset, characterized in that the protective sleeve lying in its retracted rest position, is fastened to the barrel by clamping means engaged with a retaining rim on the rear end of the barrel, and the plunger stem is provided at its rear end section extending out of the barrel, with releasing means for disengaging the clamping means from the retaining rim on the rear end of the barrel at the time when, on injecting, the forward stroke of the plunger is, or is almost completed, the releasing means thus unfastening the protective sleeve from the barrel, so that the protective sleeve is allowed to move into its advanced safety position.

Therefore, according to the invention, the protective sleeve lying in its retracted rest position, is normally fastened to the syringe barrel by clamping means engaged with a retaining rim on the rear end of the barrel. In this condition of the protective sleeve, the needle is exposed, and the syringe can be handled as usual, for example for being filled, with no risk of inadvertently displacing the protective sleeve. On injecting, at the end or a little before the end of the forward stroke of the plunger within the barrel, owing to a pressure being manually applied to the rear end of the plunger stem, the protective sleeve clamping means become automatically disengaged from the retaining rim on the barrel rear end by releasing means provided on the rear end section of the plunger stem, which are fit for automatically disengaging the clamping means from the said retaining rim. Thus, the protective sleeve is unfastened from the barrel, and is allowed to move from its retracted rest position to its advanced safety position, in which it covers the needle.

The protective sleeve having been unfastened from the barrel, can be moved manually by a user from its retracted rest position into its advanced safety position. Preferably, however, according to one preferred embodiment of the invention, a spring is fitted between the syringe barrel and the protective sleeve, and is loaded in the direction of the retracted rest position of the protective sleeve, so that on the protective sleeve being unfastened from the barrel, this spring will automatically move the protective sleeve into its advanced safety position.

The clamping means carried by the protective sleeve, and the releasing means carried by the plunger stem, may be made in any suitable manner. According to a particularly simple and not much expensive embodiment, which however is very reliable, the clamping means are in form of hook-like clamping teeth provided at their rear free ends of elastically flexible clamping tongues extending longitudinally of the protective sleeve, and being made of one piece therewith, the said clamping tongues being formed with slanted abutment faces for cooperatiing with respective actuating surfaces of a pusher member secured to the rear end section of the plunger stem, the whole arrangement being such that, on injecting, the actuating surfaces of the pusher member will be caused to act, at the end or almost at the end of the plunger forward stroke, upon the slanted abutment faces of the clamping tongues, so that these tongues will be elastically flexed from a clamping position in which their hook-like teeth are engaged with the retaining rim on the rear end of the barrel, to a releasing position in which their hook-like teeth are disengaged from the said retaining rim.

According to one preferred embodiment of the invention, by which the use of the syringe is made very comfortable, the protective sleeve lying in its retracted rest position, axially abuts backward against at least one stop member provided at the rear end of the barrel, and at its rear end is formed with at least two diametrically opposite tabs radially extending from the periphery thereof, which are sustained by two fingers of a user's hand holding the syringe at the time of an injection. Thus, when an injection is terminated, the protective sleeve having been unfastened from the barrel by the releasing means provided on the plunger stem, is moved forward on the syringe barrel, particularly owing to the bias of the spring, only when the protective sleeve rear tabs are released by the user's fingers.

According to anoher advantageous embodi-

ment of the invention, the syringe needle is attached to a needle-carrying member disengageably fitted in and/or on the barrel fore end, and the locking means for automatically retaining to the barrel the protective sleeve in its advanced safety position, are engaged with the said needle-carrying member, and preferably consist of at least one locking inward projection provided in the protective sleeve, for cooperating with a respective outward projection in the needle-carrying member, and of at least one locking tongue formed in the protective sleeve by means of cuts made therein, and extending in the longitudinal direction thereof, the forward end of the said locking tongue is integral with the protective sleeve, and the free rear end thereof tending to elastically flex radially inwardly, is for cooperating with a respective outward projection in the needle-carrying member, the whole arrangement being such that with the protective sleeve lying in its advanced safety position, the inward projection for locking the protective sleeve bears forwadly against the respective outward projection in the needle-carrying member, and the free rear end of the locking tongue bears backwardly against the respective outward projection in the needle-carrying member.

In this embodiment, the protective sleeve is locked in its advanced safety position in both directions, i.e., either forward and backward, however not directly to the syringe barrel, but to the needle-carrying member disengageably fitted in or on the barrel fore end, so that the needle-carrying member is unremovably secured to the protective sleeve. Therefore, when a person attempting to reuse the syringe, succeeds in slipping the protective sleeve off the barrel, for example in the forward direction, also the needle-carrying member and the needle are detached from the barrel along with the protective sleeve, and are firmly held and confined inside the protective sleeve.

Also other embodiments of the invention are characterized in the dependent claims, and the advantages attained thereby will become clearly apparent from the following disclosure of some embodiments shown in the accompanying drawings, in which:

Figure 1 is an exploded perspective view of a first embodiment of the syringe according to the invention.

Figure 2 is a longitudinal sectional view of the syringe according to Figure 1, with the protective sleeve lying in its retracted position.

Figure 3 shows the syringe according to Figure 2, viewed in the direction of arrow III in this latter Figure, and with some parts in section.

Figure 4 is a same view of the syringe as in Figure 3, however with the protective sleeve lying in its advanced safety position.

Figure 5 is a longitudinal sectional view of the syringe, with the protective sleeve having been separated from the syringe together with the needle-carrying member and the needle, when an attempt is made of re-using the syringe.

Figure 6 is a perspective view showing the way of holding the syringe according to Figures 1 to 5, at the time of an injection.

Figure 7 is a longitudinal sectional view in an enlarged scale, showing a detail of the syringe according to Figure 4.

Figure 8 is an exploded perspective view showing a second embodiment of the syringe according to the invention.

Figure 9 is a longitudinal sectional view in an enlarged scale showing the rear end of the syringe according to Figure 8, with the protective sleeve lying in its retracted rest position.

Figure 10 is a longitudinal sectional view in the same scale as in Figure 9, showing the fore end of the protective sleeve of the syringe according to Figure 8.

Figure 11 is a view with parts in section, showing the rear end of the syringe according to a third embodiment of the invention, with the protective sleeve lying in its advanced safety position.

Figures 12 and 13 are elevational part-sectional views showing the rear end of the syringe according to Figure 11, with the protective sleeve in its retracted rest position (Figure 12), and at the time when the said sleeve is being released from the syringe barrel (Figure 13).

Figure 14 is a cross-sectional view taken on line XIV-XIV in Figure 12.

Figures 15 and 16 are prespective views showing two details of the syringe according to Figures 11 to 14.

In the following disclosure and in the annexed Claims, by the expression "syringe fore end" we mean the end of the syringe that is fitted with the injection needle, and the rear end of the syringe is the end thereof lying opposite to the needle. Also, all the syringe members, but for the needle, are preferably made from a suitable plastics material, or the like, unless when it is differently specified.

Referring to the embodiment shown in Figures 1 to 7, the disposable safety syringe comprises a barrel 1 with a conical forward end 2 on which the needle-carrying member 3 is fitted and is held by friction by means of a matching conical hole formed at the rear end thereof, the rear end of needle 4 being firmly incorporated in the said hole. The needle 4 is normally protected by a needle-covering cap 5 disengageably fitted on the fore end of the needle-carrying member 3 so as to be caused to abut against an undercut 103 provided therein. In barrel 1 a plunger 6 is axially slidable in a fluid-tight manner, and the head 8 of the man-

ually drivable stem 7 is engaged in the said plunger. The rear end section of stem 7 extends backwardly out of barrel 1, and is provided with a knob 9 on the rear end thereof. Preferably, the stem 7 has in cross-section a non-circular shape, and is for example, T-like or X-like shaped. The rear end portion of barrel 1 is so enlarged that a substantially cylindrical boxlike head 10 is formed, and is provided with two diametrically opposite tabs 11 radially extending from its periphery.

A protective sleeve 12 is fitted on the outside of barrel 1 so as to be longitudinally slidable thereon. The rear end of the protective sleeve 12 is formed with two diametrically opposite tabs 13 which extend radially from the periphery thereof, and are like the tabs 11 of barrel 1. A helical spiral spring 15 of metal is interposed between an inward step 14, provided in the protective sleeve 12 at a distance from its rear end, and the boxlike head 10 of barrel 1.

The protective sleeve 12 is provided at its rear end with two clamping tongues 16 which are made of one piece therewith, and are formed therein at two diametrically opposite locations. Each clamping tongue 16 extends lengthwise of the protective sleeve 12, at a longitudinal aperture 47 made therein. The forward end of the clamping tongue 16, i.e., the end thereof which is turned toward the needle 4, is integral with the protective sleeve 12, and its rear end extends beyond the rear end of the protective sleeve 12, and protrudes from the rear end thereof. Each clamping tongue 16 can be elastically flexed outwardly in the radial direction, and at its rear end is formed with a hook-like clamping tooth 17 which is turned radially inwardly. Each clamping tongue 16 is further provided at the rear end of its clamping tooth 17 with a slanted abutment face 18 which is downwardly inwardly inclined, and is for cooperating with the correspondingly inclined peripheral side edge of a disc-shaped pusher member 19 secured to the stem 7 of plunger 6 at the rear side of the boxlike head 10 of barrel 1, which is opposite to the clamping tongues 16.

The boxlike head 10 at the rear end of barrel 1 is formed close to each clamping tongue 16, with an aperture 20 extending into the bottom and into the sidewall of the said boxlike head 10. Thus, each clamping tongue 16 is allowed to penetrate into the boxlike head 10 and to be engaged by its hook-like clamping tooth 17 with the bottom of the said head 10. By means of cuts made in the sidewall of the boxlike head 10 at the rear end of barrel 1, two diametrically opposite, slip back-preventing teeth 21 are formed, which are angularly offset by 90° from the two apertures 20 for the clamping tongues 16. The slip back-preventing teeth 21 can be caused to elastically diverge radially outwardly from each other, and have their facing inward sides formed with slanted abutment faces 22 which are downwardly inwardly inclined, and are for cooperating with the correspondingly inclined peripheral side edge of the disc-shaped pusher member 19.

In the fore part of the protective sleeve 12 two diametrically opposite locking tongues 23 are provided, which are formed in the protective sleeve 12 by means of cuts 24 made therein. Each locking tongue 23 extends in the longitudinal direction of the protective sleeve 12. The forward end of each locking tongue 23 is integral with the protective sleeve 12, and the rear end thereof is loose and tends to elastically flex radially inwardly. The rear free ends of the locking tongues 23 are for cooperating with a peripheral outward undercut 203 in the needle-carrying member 3. The protective sleeve 12 is formed in the direction of the syringe rear end, at a distance from the locking tongues 23, with an inward locking projection 25 which may be made in form of an annular undercut or may consist of the fore ends of a plurality of ribs (not shown) provided at the interior of the protective sleeve 12. The inward projection 25 for locking the protective sleeve 12, is for cooperating with the annular edge portion 303 of the rear end rim 303 of the needle-carrying member 3. The needle-carrying member 3 having been fittedly positioned on the fore end 2 of barrel 1, actually protrudes from the periphery of barrel 1 by the edge portion of its rear end rim, so that an outward annular step 303 is formed, which is associated with the inward locking projection 25 in the protective sleeve 12.

A tubular member 26 is engaged in the fore end of the protective sleeve 12, and is fastened thereto such as by glueing or by welding. The rear end rim of the said tubular member 26 forms a retaining inward annular projection 27 in the protective sleeve 12, and its front hole 28 is tapered relative to the inside diameter of the protective sleeve 12, and is only slightly greater than the outside diameter of the rear end portion of the needle-covering cap 5.

The syringe is sold to a user in the condition shown in Figures 2 and 3, in which the plunger 6 is slightly drawn back from its forwardmost position, in which the syringe is entirely discharged. In this condition of the syringe, the disc-shaped pusher member 19 is a little out of the boxlike head 10 at the rear end of barrel 1, and is prevented from getting into the said head by a tearable safety strip 29 of paper or paperboard, or the like. Through a hole 30 and a radial cut 31 the said strip 29 is threaded on the stem 7 of plunger 6 and is positioned between the disc-shaped pusher member 19 and the rim of the opening at the rear end side of the said boxlike head 10. The protective sleeve 12

lies in its retracted rest position in which the clamping tongues 16 are caused to penetrate through the apertures 20 into the boxlike head 10 of barrel 1. Thus, the hook-like clamping teeth 17 of the clamping tongues 16 are engaged with the bottom of the said head 10, whereby the protective sleeve 12 is fastened to the barrel 1. With the protective sleeve 12 lying in its retracted rest position, the spring 15 is loaded, that is, compressed, and the tabs 13 radially extending from the periphery of the protective sleeve 12, are caused to bear, or almost bear against the forward face of the corresponding tabs 11 provided on the boxlike head 10 of barrel 1. Moreover, when the protective sleeve 12 is in its retracted rest position, the tapered fore part 26 thereof extends substantially to the forward end of the needle-carrying member 3, so that the needle 4 is set free in an exposed condition when the needle-covering cap 5 will be forwardly disengaged. Concurrently, the protective sleeve 12 is caused to bear, or almost bear by its inward annular projection 27 formed by the rear end rim of the tubular member 26, backwardly against the outward annular undercut 203 in the needle-carrying member 3. In the above-disclosed condition of the syringe according to Figures 2 and 3, the plunger 6 can be freely retracted by drawing back its stem 7, so that the syringe barrel 1 will be filled as usual by sucking the to-be-injected liquid through the exposed needle 4.

To be allowed to make an injection, the safety strip 29 has to be torn away, and the syringe has to be held as shown in Figure 6, with two fingers of a user's hand resting each on the front side of the respective tab 13 extending radially from the periphery of the rear end of the protective sleeve 12, and with the user's thumb placed on the knob 9 of the plunger stem 7 pressing forward the plunger 6. Toward the end of the plunger 6 foward stroke, the disc-shaped pusher member 19 is caused to penetrate into the barrel 1 boxlike head 10 from the rear end opening thereof, and by its peripheral side edge is caused to act on the slanted abutment faces 18 of the clamping tongues 16. Therefore, the clamping tongues 16 are caused to elastically diverge outwardly from each other, so that their hook-like clamping teeth 17 become disengaged from the bottom of the boxlike head 10 of barrel 1. The protective sleeve 12 is thus unfastened from barrel 1, but is still retained in its retracted rest position against the load of the pressure spring 15, until the syringe is held by the operator's hand, as disclosed by referring to Figure 6. Before and/or as the clamping tongues 16 are opened out as disclosed above, the disc-shaped pusher member 19 is caused to act by its peripheral side edge also upon the slanted abutment faces 22 of the slip back-preventing teeth 21, and to get thereover. The said teeth 21 are thus elastically opened out, so that they are caused to snappingly engage the top side of the disc-shaped pusher member 19. Therefore, on injecting, the pusher member 19 is locked in the boxlike head 10 of barrel 1 at the end or almost at the end of the forward stroke of plunger 6, between the bottom of the said head 10 and the slip back-preventing teeth 21, in such a position that the clamping tongues 16 are kept in their opened out condition, and the protective sleeve 12 is thus disengaged from the barrel 1, as shown in the upper part of Figure 4.

Once the injection has been made, the peripheral radial tabs 13 extening from the rear end of the protective sleeve 12 are released, so that the protecive sleeve which is now disengaged from the barrel 1, is moved forward by the spring 15, either gradually or snappingly into its advanced safety position shown in Figure 4. The protective sleeve lying in its advanced safety position, extends around the needle 4 so as to entirely cover the same. The protective sleeve 12 is at the same time caused to abut by its inward locking projection 25, backward against the annular step 303 formed by the edge portion of the rear end rim of the needle-carrying member 3, and the rear free ends of the locking tongues 23 are simultaneously caused to bear backward against the outward annular undercut 203 in the needle-carrying member 3, as more particularly shown in Figure 7. Thus, the protective sleeve lying in its advanced safety position, is unremovably locked to the barrel 1 in both senses of its longitudinal direction, i.e., either forward and backward, by means of the needle-carrying member 3. Should a person attempt to slip the protective sleeve 12 forwardly off the cylinder 1 when trying to re-use the syringe, the needle-carrying member 3 would be, at the most, disengaged from the conical forward end of barrel 1, so that the protective sleeve 12 would be detached from barrel 1 together with the needle-carrying member 3 that is inseparably shut in the protective sleeve 12, and so together with the needle 4 enclosed in the protective barrel 12, as shown in Figure 5. The protective sleeve 12 can be made with no problem and at a low cost from such a tough and strong plastics material that the protective sleeve could not be broken without damaging and rendering the needle-carrying member 3 and also the needle 4 unusable. Moreover, the fore part 26 of the protective sleeve 12 has such a narrow hole 28 and extends over such a long section beyond the pointed end of needle 4, that the finger of a person is prevented from reaching to the needle 4 from the fore end of the syringe.

The stem 7 of plunger 6 may be provided with an easily breakable weakened portion 32 at a point between the disc-shaped pusher member 19 and

the knob 9 on the rear end of stem 7, preferably at a point being adjacent to the disc-shaped pusher member 19. Owing to the provision of this weakened portion, the rear end section of stem 7 will be broken when an attempt is made to pull back the plunger 6 for trying to re-use the syringe, once the disc-shaped pusher member 19 has been locked in the boxlike head 10 of barrel 1 by the slip back-preventing teeth 21.

The protective sleeve 12 can be slidably but non-rotatably fitted on the barrel 1 with the aid of simple means known to those skilled in the art, such as by an inward projection in sleeve 12, slidably engaged in a longitudinal groove in the outward side of barrel 1, or vice-versa.

The embodiment of the syringe according to Figures 8, 9, and 10, substantially corresponds to the emdbodiment as disclosed above by referring to the Figures 1 to 7, like parts being designated by the same reference numerals.

However, in the modified embodiment according to Figures 8 to 10, the boxlike head 10 at the rear end of barrel 1 has a sidewall 33 radially covering from the outside the rear free ends forming the hook-like clamping teeth 17 of the clamping tongues 16, which have been caused to get into the said boxlike head 10 through the apertures 20' in the bottom thereof. The removable safety means for initially preventing the disc-shaped pusher member 1 from entering into the boxlike head 10 at the rear end of barrel 1, consist of a substantially part-circular small cover member 34 formed with a central opening 36 for allowing the stem 7 to pass therethrough, which is provided in place of the tearable strip 29 of paper or paperboard. The small cover member 34 is applied to the opening at the rear end side of the box-like head 10 and, for this purpose, is formed at its front side which is turned toward the syringe fore end, with two diametrically opposite wedge-shaped teeth 35. The said teeth 35 which extend from the cover member 34, are introduced into the opening at the rear end side of the boxlike head 10 so as to be inserted between the two clamping tongues 16 which by means of their hook-like clamping teeth 17, are engaged with the bottom of the said boxlike head 10, and the respective portion of the sidewall 33 thereof, as shown in Figure 9. Thus, the two teeth 35 will hold the cover member 34 in position on the boxlike head 10 at the rear end of barrel 1, and at the same time will prevent the rear free ends of the clamping tongues 16 from being radially outwardly flexed and then from being disengaged from the said box-like head 10. The thus applied cover member 34 partly closes the opening of the boxlike head 10 at the rear end of barrel 1, and therefore prevents the disc-shaped pusher member 19 from entering into the said head 10.

Before the syringe being used for an injection, the cover member 34 must be removed. Therefore, a syringe user has to grip the said cover member 34 with two fingers of its hand close to the preferably indented peripheral edge thereof, at two diametrically opposite positions, so as to axially disengage the said cover member 34 from the boxlike head 10 at the rear end of barrel 1, and to nextly slip the same radially off the stem 7 of plunger 6.

According to the embodiment shown in Figures 8, 9, and 10, the tubular member 26' forming the fore part of the protective sleeve 12, has an tapered front hole 28 which is only a little wider than the rear end portion of the needle-covering cap 5. The said tubular member 26' is threaded on the outside of the protective sleeve 12 and is snappingly engaged therewith in an unremovable manner. Therefore, the protective sleeve 12 is provided with a front end section of a reduced diameter, in which the locking tongues 23 are formed, and on which the tubular member 26' is fitted so as to be caused to abut against an outward annular undercut 39 formed in the protective sleeve 12. The tubular member 26' is locked in this position by two outward detents 37 which are provided in diametrically opposite positions on the outside of the protective sleeve 12, and are snappingly engaged into respective peripheral slots 38 in the tubular member 26'. With the tubular member 26' being in its engaged position, the said tubular member is caused to abut by an inward annular step 27' thereof, against the front end rim of the protective sleeve 12, as more particularly shown in Figure 10. The width of the internal annular step 27' is such that this step partly extends also into the protective sleeve 12, so that its radially inwardly edge portion forms the retaining annular projection which is for cooperating with the outward annular undercut 203 in the needle-carrying member 3.

Also in Figures 11 to 16 showing a further modified embodiment of the syringe according to the invention, the already described parts are designated by the same reference numerals. A platelet 40, which is shown in upturned position in Figure 16, is arranged on the bottom of the boxlike head 10 of barrel 1, and by means of two diametrically opposite tongues 41 is engaged in the respective apertures 42 formed in the bottom of the said head 10. The platelet 40 is thus non-rotatably retained in the boxlike head 10 of barrel 1, and is caused to non-rotatably guide the stem 7 of plunger 6. the stem 7 is T-shaped in cross section, and by the leg of its T-shaped cross-section is passed through a relative narrow opening 43 in platelet 40. Instead of two diametrically opposite clamping tongues 16 as provided in the embodiments shown in Figures 1 to 10, two pairs of diametrically opposite clamping tongues 16' are provided in the syringe according

to the modified embodiment shown in Figures 11 to 16, at respective longitudinal apertures 47 in the protective sleeve 12. The two clamping tongues 16' of each pair are arranged in facing relation along an arc, and in a substantially tangential plane, with their hook-like clamping teeth 17' being turned outwardly in opposite directions, and with their slanted abutment faces 18' being downwardly outwardly inclined. Each pair of clamping tongues 16' is caused to get into the boxlike head 10 at the rear end of barrel 1 through an aperture 20'in the bottom of the said head 10, and through a relative peripheral aperture 44 formed in platelet 40. The hook-like clamping teeth 17' of the clamping tongues 16' are each engaged with the edges of the relative peripheral aperture 44 in platelet 40. In register with each pair of clamping tongues 16', the disc-shaped pusher member 19' secured to the stem 7 of plunger 6, is formed with an opening consisting of a peripheral recess 45. On injecting, the free ends of the pairs of clamping tongues 16' come to be inserted at the end, or almost at the end of the forward stroke of plunger 6, into the peripheral recesses 45 in the disc-shaped pusher member 19' which is thus caused to cooperate with the slanted abutment faces 18' of the said pairs of clamping tongues 16', so that it elastically draws the two clamping tongues 16' of each pair near to each other, as more particularly shown in Figure 13. Thus, the hook-like clamping teeth 17' of the clamping tongues 16' become disengaged from the edges of the respective peripheral aperture 44 in platelet 40 at the bottom of the boxlike head 10 on the rear end of barrel 1, so that the protective sleeve 1 is unfastened from the barrel 1, and is moved forward by the bias of spring 15, as disclosed above by referring to Figures 1 to 7. At the time when the injection is terminated, the disc-shaped pusher member 19' becomes locked between the said platelet 40 and the slip-back preventing teeth 21 provided in the boxlike head 10, as more particularly shown in Figure 11. The diametrically opposite tabs 11 radially extending from the periphery of the boxlike head 10, are preferably fitted with pins 46 which are engaged in respective holes in tabs 13 radially extending from the periphery of the protective sleeve 12.

Claims

1. A disposable safety syringe which comprises a barrel (1), an injection needle (4) fitted on the fore end of barrel (1), a plunger (6) being slidable in barrel (1) from a syringe-filling utmost retracted position to a syringe-emptying forwardmost position, and which is fitted with a manually drivable stem (7) protruding from the rear end of barrel (1), a longitudinally slidable protective sleeve (12) slidably fitted on the outside of barrel (1), so as to be movable from a retracted rest position in which the needle (4) is exposed, into an advanced safety position in which the protective sleeve (12) extends around the needle (4), so as to entirely cover the same, and with locking means (23, 25) for automatically retaining in a not retractil manner the protective sleeve (12) to the barrel (1) in its advanced safety position, characterized in that the protective sleeve (12) lying in its retracted rest position, is fastened to the barrel (1) by clamping means (16, 17; 16', 17') engaged with a retaining rim on the rear end of barrel (1), and the stem (7) of plunger (6) is provided at its rear end section extending out of barrel (1), with releasing means (19, 19') for disengaging the clamping means (16, 17; 16', 17') from the retaining rim on the rear end of barrel (1) at the time when, on injecting, the forward stroke of plunger (6) is, or is almost completed, the said releasing means thus unfastening the protective sleeve (12) from barrel (1) and allowing the protective sleeve to be moved into its advanced safety position.

2. The syringe according to Claim 1, characterized in that a spring (15) is fitted between the syringe barrel (1) and the protective sleeve (12), and is loaded in the direction of the retracted rest position of the protective sleeve (12), so that on the protective sleeve being unfastened from the barrel (1), this spring will automatically move the protective sleeve into its advanced safety position

3. The syringe according to Claims 1 and 2, characterized in that the clamping means are in form of hook-like clamping teeth (17, 17'), provided at the rear free ends of elastically flexible clamping tongues (16, 16') extending in the longitudinal direction of the protective sleeve (12), and being made of one piece therewith, the said clamping tongues (16; 16') being formed with slanted abutment faces (18; 18') for cooperating with respective actuating surfaces of a member (19; 19') secured to the rear end section of the plunger stem (7), the whole arrangement being such that, on injecting, the actuating surfaces of the said pusher member (19; 19') will be caused to act, at the end or almost at the end of the forward stroke of plunger (6), upon the slanted abutment faces (18; 18') of the clamping tongues (16; 16'), so that these tongues will be elastically flexed from a clamping position in which their hook- like teeth (17; 17') are engaged with the retaining rim on the rear end of barrel (1), to a

releasing position in which their teeth (17; 17') are disengaged from the said retaining rim.

4. The syringe according to Claims 1 to 3, characterized in that two diametrically opposite clamping tongues (16) are provided, with their slanted abutment faces (18) being turned toward each other, which can be elastically opened out radially from their clamping position into their releasing position by a disc-shaped pusher member (19) secured to the rear end section of stem (7) of plunger (6), which is axially fittable in between the said tongues (16).

5. The syringe according to Claims 1 to 3, characterized in that two pairs of diametrically opposite clamping tongues (16', 16') are provided, the tongues (16') of each pair having the slanted abutment faces (18') of their hook-like clamping teeth (17') turned outwardly in opposite directions, and being elastically drawable near to each other from their clamping position into their releasing position by a disc-shaped pusher member (19') which is secured to the rear end section of the stem 7 of plunger (6), and is formed with a recess (45) for each pair of tongues (16', 16'), into which the respective pair of tongues (16', 16') is axially insertable.

6. The syringe according to Claims 1 to 3, characterized in that two diametrically opposite, slip back-preventing teeth (21) are provided at the rear end of barrel (1), which teeth can be caused to elastically diverge radially outwardly from each other, and have their facing inward sides formed with slanted abutment faces (22), the said slip back-preventing teeth (21) being caused to cooperate with the pusher member (19; 19') secured to the rear end section of the stem (7) of plunger (6), in such a manner that the said teeth (21) when being elastically flexed in the outward direction, will allow the pusher member (19; 19') to pass therebetween, and will be then engaged with the rear side of the pusher member (19; 19'), so that the pusher member (19; 19') becomes locked together with the stem (7) of plunger (6), in the forwardmost position of the plunger stroke, whereby any backward displacement of the pusher member (19; 19') and the stem (7) is prevented.

7. The syringe according to Claims 1 to 3, and Claim 6, characterized in that the slip back-preventing teeth (21) are formed in the sidewall of a boxlike head (10) by means of cuts made therein, which is integrally provided at the rear end of barrel (1), and the clamping tongues (16; 16') protruding from the rear end of the protective sleeve (12), extend by their free ends formed with the hook-like clamping teeth (17; 17') and the slanted abutment faces (18; 18'), into the said boxlike head (10), by being passed through respective apertures (20; 20', 44) formed in the bottom of the said head (10), the retaining rims at the rear end of barrel (1) being provided by the edges of said apertures with which the said clamping teeth (17, 17') are engaged, the boxlike head (10) being formed with an opening at its rear side for the disc-shaped pusher member (19; 19') secured to the rear end section of the stem (7) of plunger (6), to get into the said head 10.

8. The syringe according to Claim 7, characterized in that removable safety means (29; 34) are provided for closing at least partly the opening at the rear end of the boxlike head (10) and for preventing the pusher member (19, 19') from getting into the said head (10).

9. The syringe according to Claim 8, characterized in that the removable safety means are in form of a tearable strip (29) of paper or paperboard, which through a hole (30) and a radial cut (31) is threaded on the stem (7) of plunger (6) so as to be positioned between the pusher member (9) and the boxlike head (10) at the rear end of barrel (1), and is caused to cooperate with the rim of the opening at the rear end of said head (10).

10. The syringe according to Claim 8, characterized in that the removable safety means are in form of a cover member (34) which is provided with a radial cut (36) for the stem (7) of plunger (6) to be passed threthrough, and is applicable to the opening at the rear end of the boxlike head (10) of barrel (1) by means of extensions (35) which are fitted in the said head (10), and are caused to cooperate with the clamping tongues (16) so as to prevent the said tongues from being flexed into their releasing position.

11. The syringe according to Claims 1 to 3, characterized in that the protective sleeve (12) lying in its retracted rest position, axially bears backward against at least one stop member (11) provided on the rear end of barrel (1), and the said sleeve is formed at its rear end with at least two diametrically opposite tabs (13) radially extending from the periphery thereof, which are to be sustained by two fingers of a

user's hand holding the syringe at the time of an injection.

12. The syringe according to Claims 1 to 3, characterized in that the syringe needle (4) is attached to a needle-carrying member (3) which is disengageably fitted in and/or on the fore end (2) of barrel (1), and the locking means (23, 25) for automatically retaining the protective sleeve (12) to the barrel (1) in its advanced safety position, are engaged with the said needle-carrying member (3).

13. The syringe according to Claim 12, characterized in that the locking means consist of at least one inward locking projection (25) in the protective sleeve (12), which is caused to cooperate with a respective outward projection (303) in the needle-carrying member (3), and of at least one locking tongue (23) formed in the protective sleeve (12) by means of cuts made therein, and extending in the longitudinal direction thereof, the fore end of the said locking tongue (23) being integral with the protective sleeve (12), and the rear free end thereof tending to elastically flex radially inwardly, is caused to cooperate with a respective outward projection (203) in the needle-carrying member (3), the whole arrangement being such that with the protective sleeve (12) lying in its advanced safety position, the inward projection (25) for locking the said sleeve, bears forwardly against the respective outward projection (303) in the needle-carrying member (3), and the rear free end of the locking tongue (23) bears backwardly against the respective outward projection (203) in the needle-carrying member (3).

14. The syringe according to Claims 1 to 3, characterized in that the protective sleeve (12) lying in its retracted rest position, bears by its retaining inward projection (27) against an outward projection (203) in the needle-carrying member (3), whereby the said sleeve (12) prevents the needle-carrying member (3) from being slipped off the fore end of barrel (1).

15. The syringe according to Claim 14, characterized in that the protective sleeve (12) lying in its retracted rest position, has its fore end arranged close to the rear end of a needle-covering cap (5) disengageably fitted on the fore end of the needle-carrying member (3), the inside diameterer of the front hole (28) at the fore part of the protective sleeve (12) being tapered relative to the inside diameter of the rest of the said sleeve (12), and being only slightly greater than the outside diameter of the matching rear end portion of the needle-covering cap (5).

16. The syringe according to Claims 14 and 15, characterized in that the tapered front hole (28), and the retaining inwaard projection (27) in the protective sleeve (12), are formed by a tubular member (26; 26') fitted in and/or on the protective sleeve (12), and unremovably secured thereto.

17. The syringe according to Claims 1 to 3, characterized in that the stem (7) of plunger (6) is provided with an easily breakable weakened portion (32) at a point between the pusher member (19, 19') and the knob (9) on the rear end of stem (7).

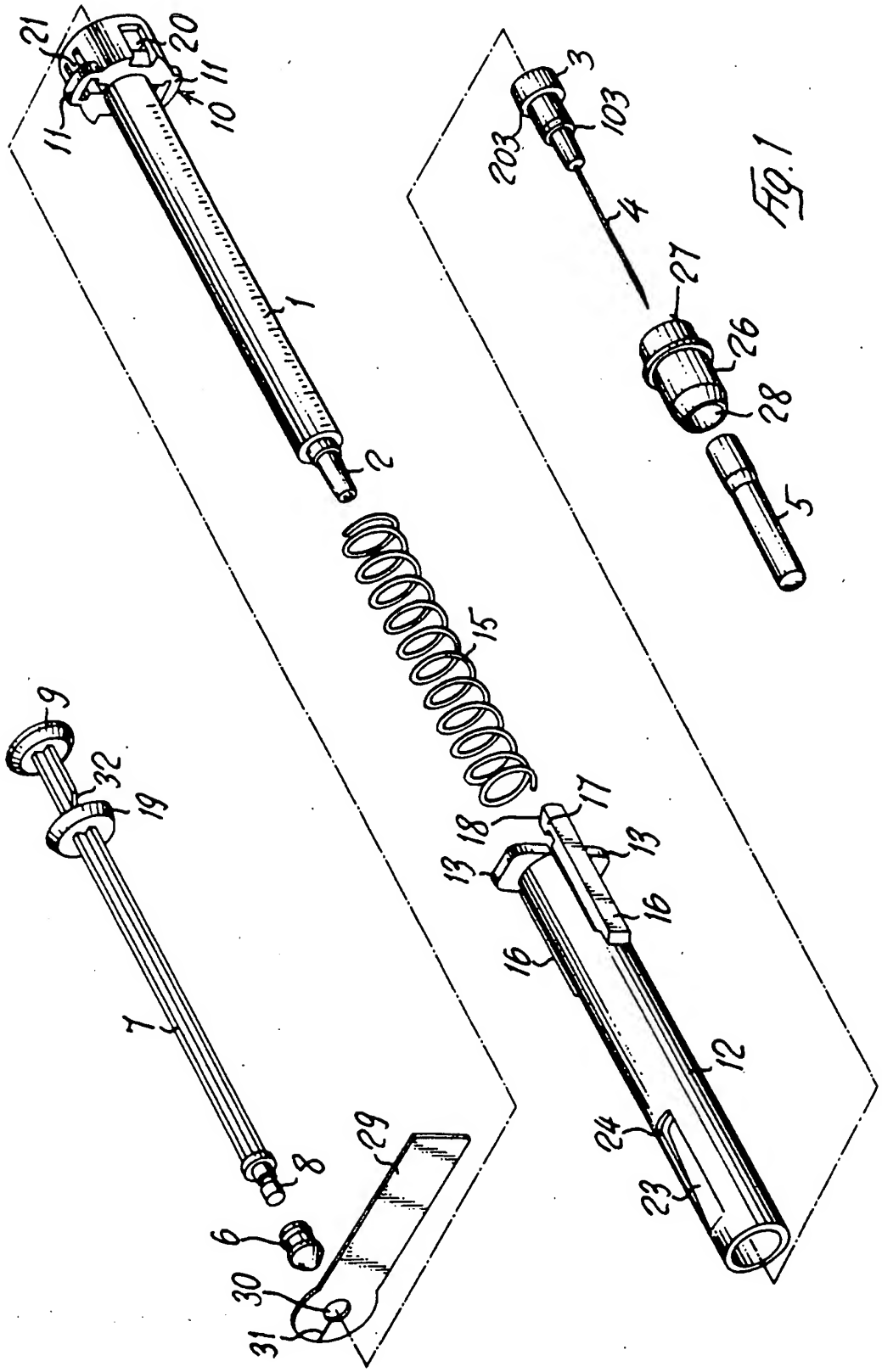
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Fig. 1

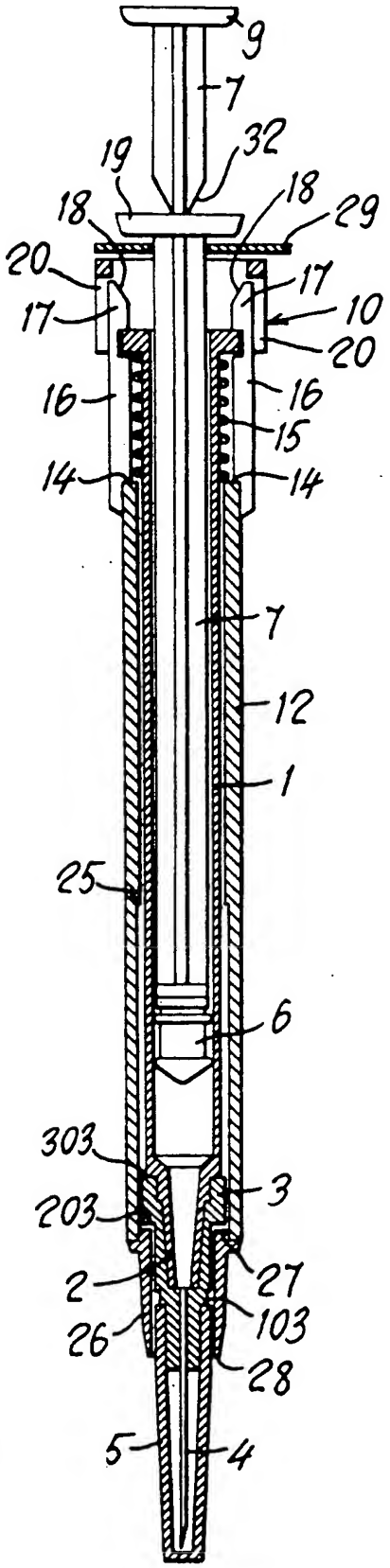
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Fig. 2

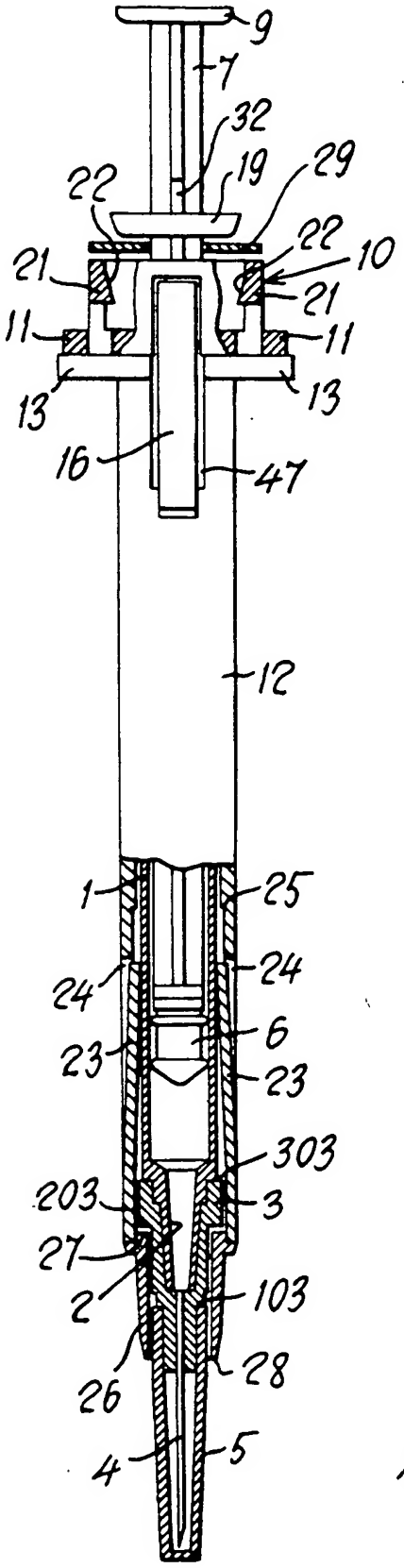
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Fig. 3

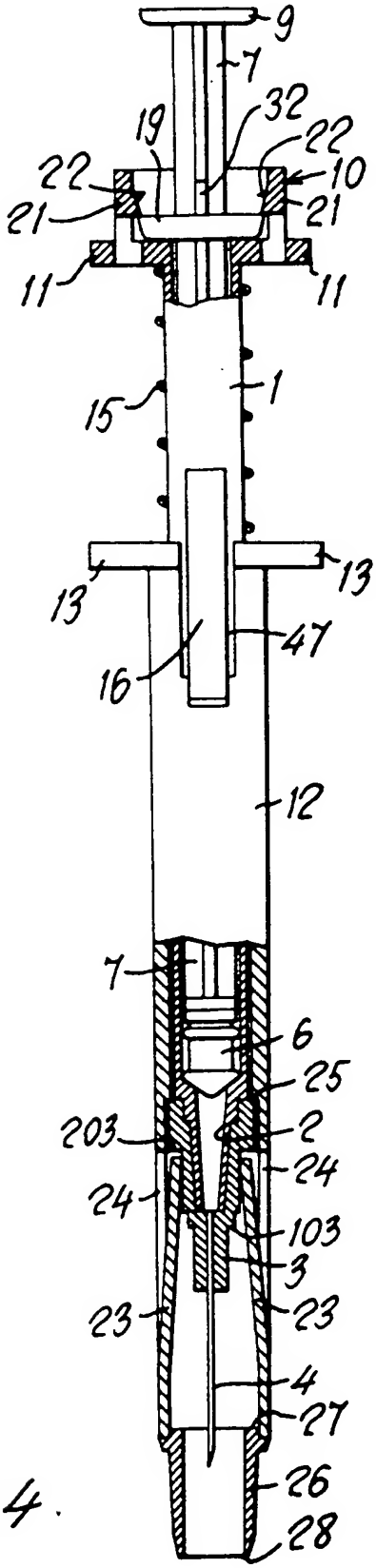
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Fig. 4.

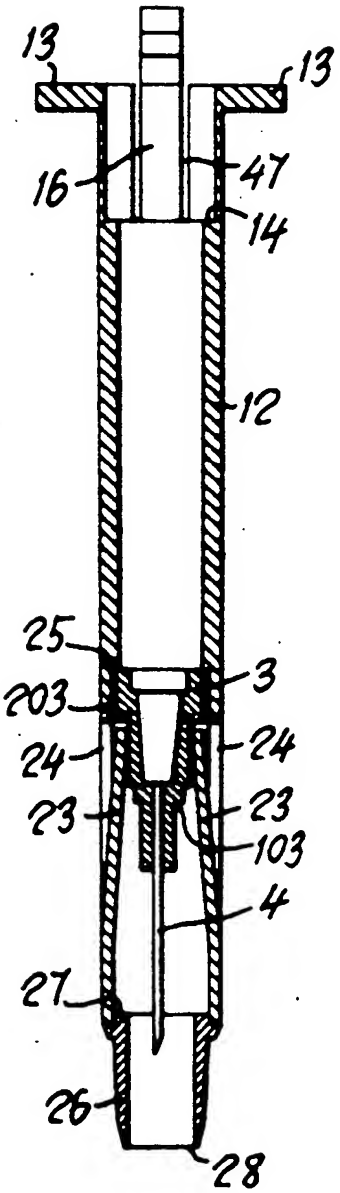

Fig. 5

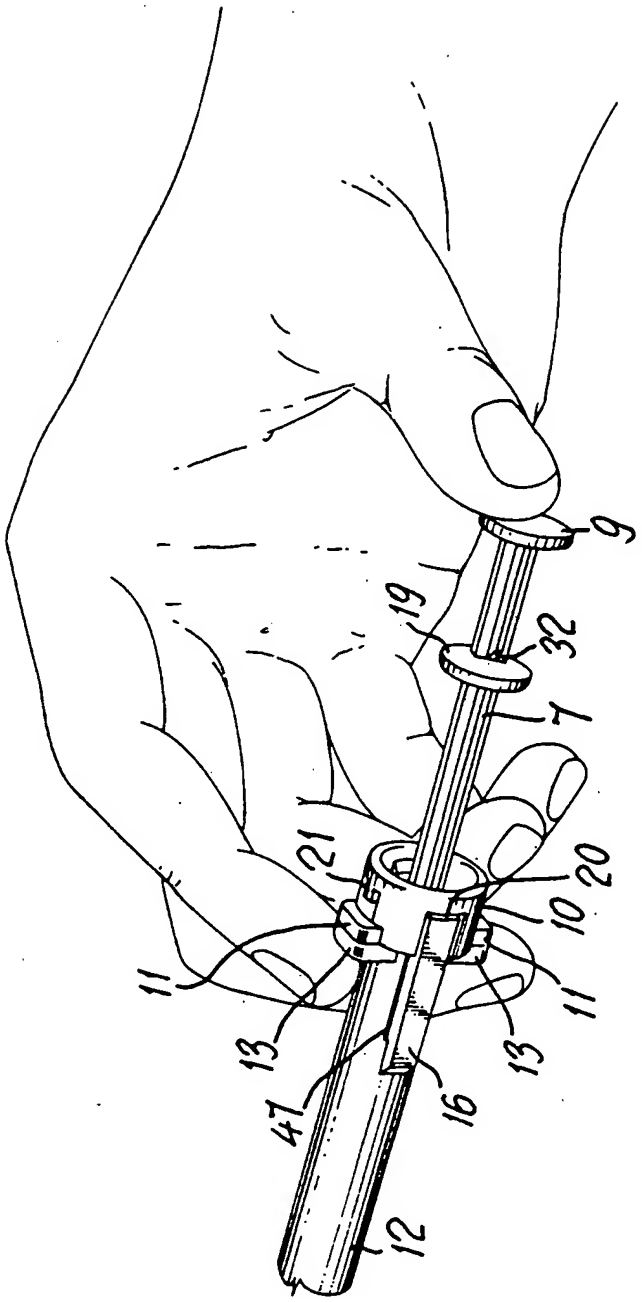

Fig.6

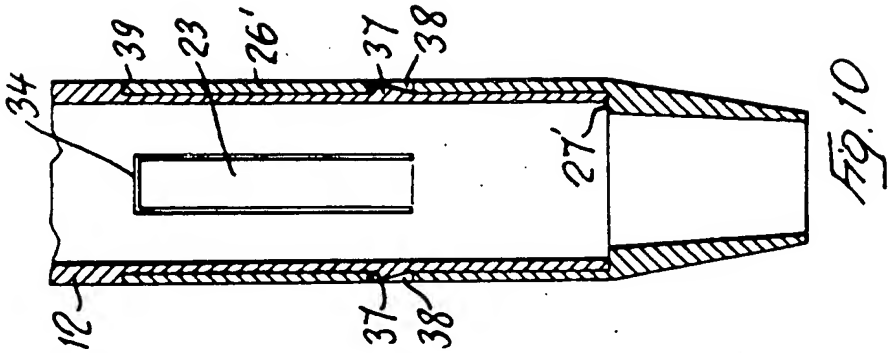

Fig. 10

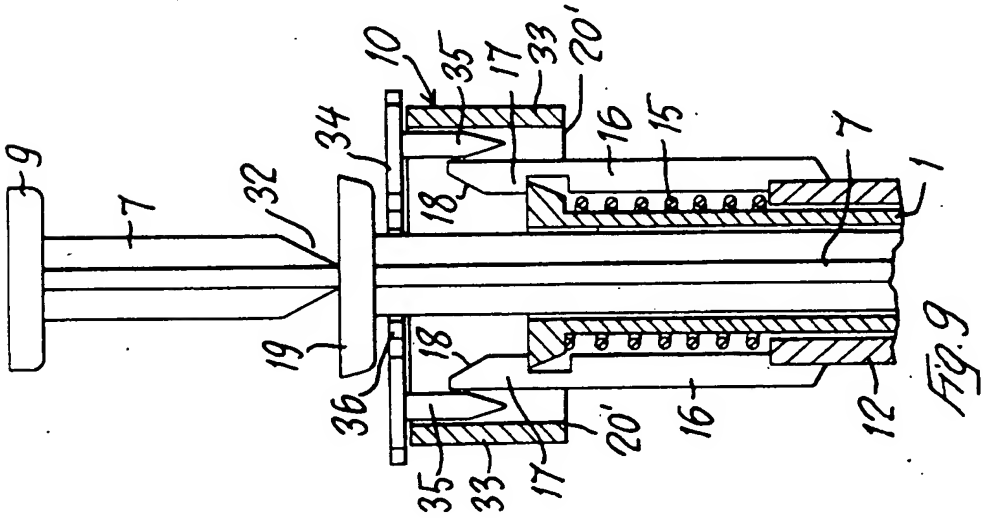

Fig. 9

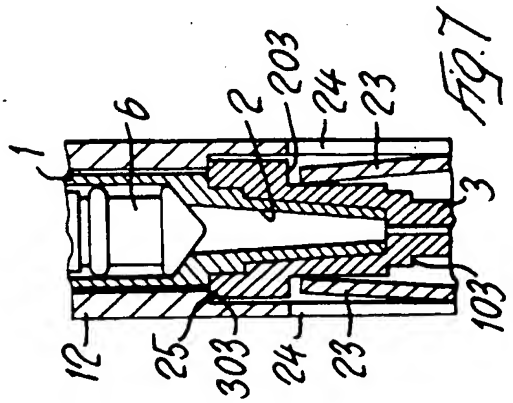

Fig. 7

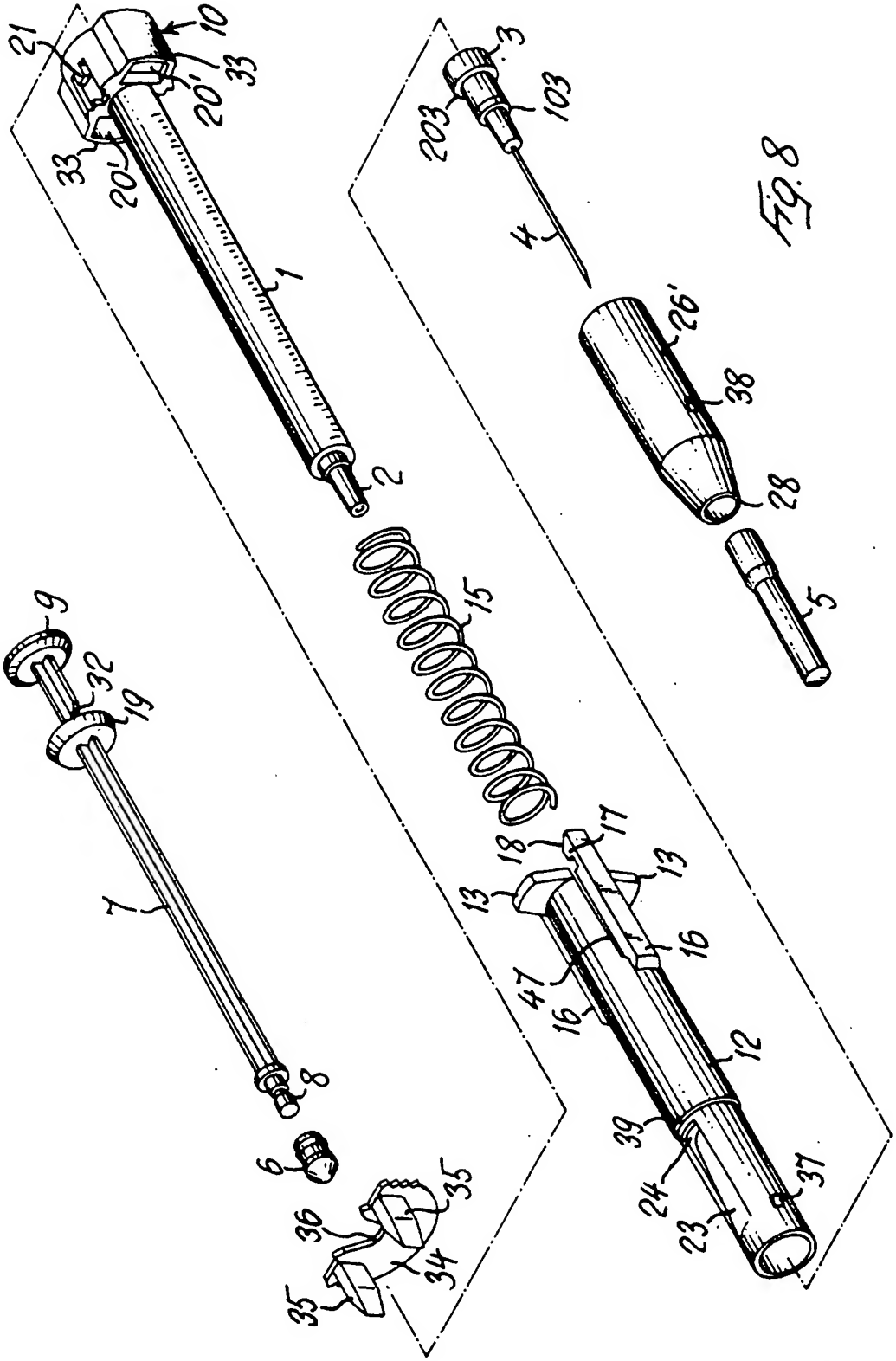
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Fig. 8

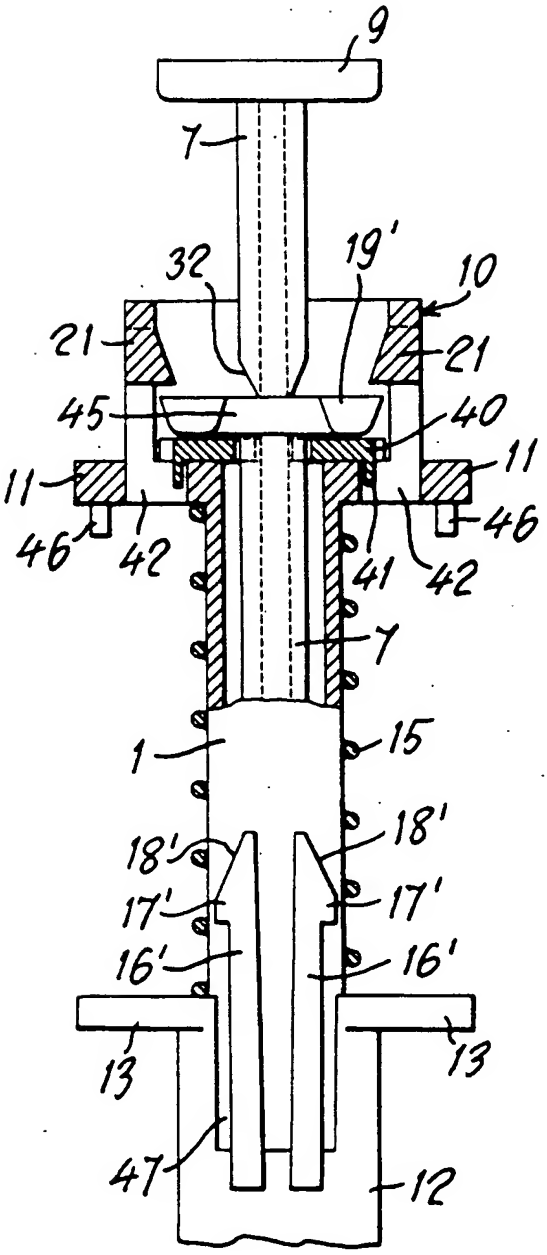
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Fig.11

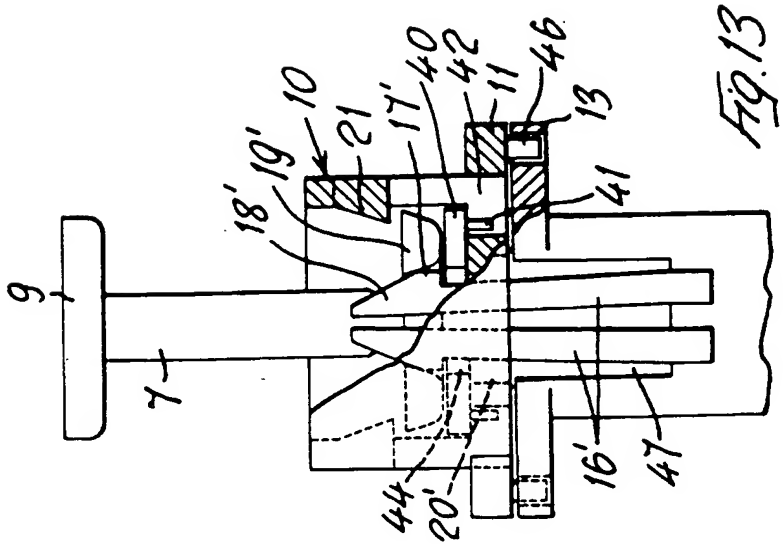
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Fig.13

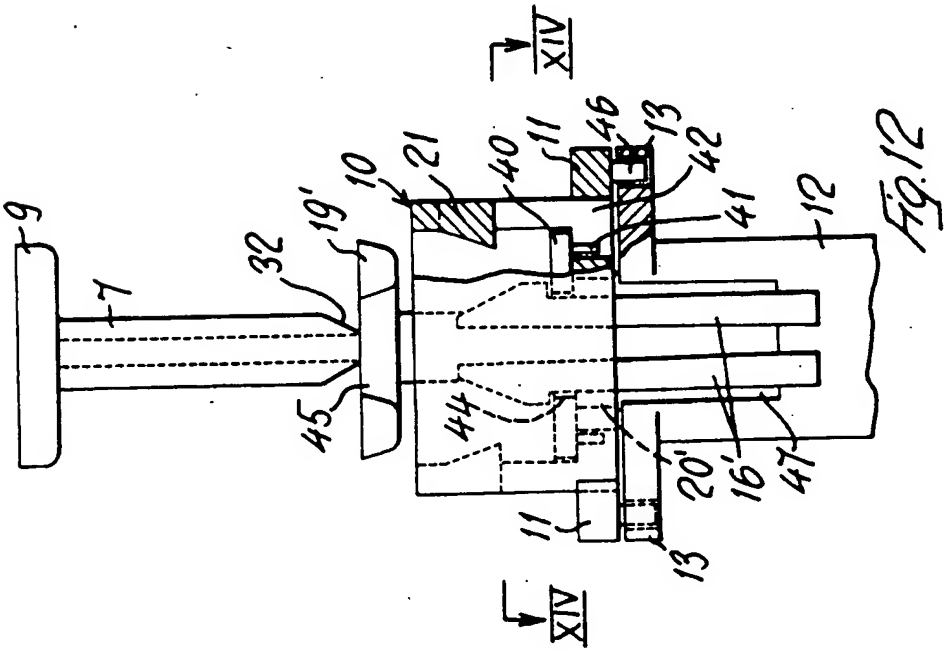
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Fig.12

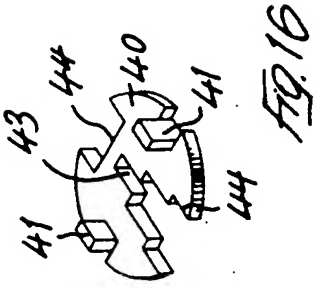

FIG.16

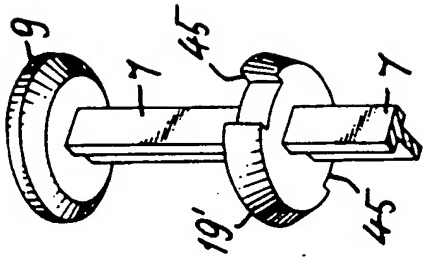

FIG.15

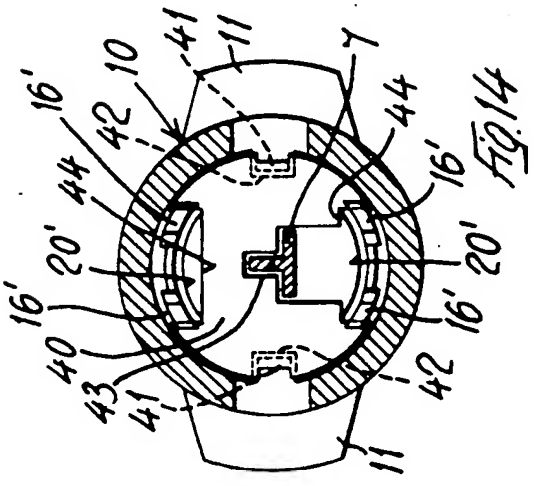

FIG.14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 1239

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 307 367 (AR.MA.S.R.L.) * column 6, line 29 - line 56; figures 7-10 *	1,2	A61M5/32
Y		3,4,12, 14,15	
Y	US-A-4 927 018 (YANG ET AL.) * column 2, line 32; figures 2,3 *	3,4,12, 14,15	
A	FR-A-1 567 778 (IDA SOLOWEY) * page 2, line 38 - line 41; figures 2,3 *	6	
A	GB-A-2 197 792 (POWER ET AL.) * page 5, line 15 - line 16; figure 4 *	7	
A	US-A-4 927 416 (TOMKIEL) * column 2, line 32; figures 2,3 *	7	
A	US-A-4 935 015 (HALL) * figure 3 *	17	
X,P	EP-A-0 405 039 (GUERINEAU) * column 2, line 16 - line 21; figure 2 *	1-4	TECHNICAL FIELDS SEARCHED (Int. Cl.5) A61M
X,P	FR-A-2 650 187 (GUERINEAU) * page 5, line 5 - line 8; figures 2,3,5-7,11 *	1,2,12	
A,P		13	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 SEPTEMBER 1991	SEDY, R.

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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